There are several factors holding back development in the 5.8 GHz band. The current price of parts is higher in this band and there are fewer parts available. Solving the power consumption problem resulting from the coverage area reduction that occurs (due to increased transmission losses) is another challenge. There are two advantages to using this band that will contribute to overcoming these hurdles. One advantage is that it is easier to implement high data rates in this band (e.g. 30 Mbps), so as greater bandwidths are needed, new products should migrate to this band. The other advantage is that the FCC has allocated significant bandwidth in the 5.2-5.3 GHz range for wireless National Information Infrastructure (NII) access. Development of products for this service should have a similar impact in this band that PCS development had at 2.4 GHz.

It should also be noted that the FCC has several new spectrum proposals under consideration. Of interest to DSRC users are the relocation and expansion of the General Wireless Communications service to 4.9 GHz and an allocation for the Advanced Mobile and Fixed Communications Service at 2.1 GHz. Assignment and development of services in these spectrum allocations will bring both advances in applications, decreases in prices, and increased availability of parts in the 2.4 GHz and 5.8 GHz bands.

IX. What are the issues in using these products for DSRC applications?

The following issues must be addressed to determine if any of these alternative technologies are candidates to perform DSRC-type functions. This is not an exhaustive list, but they represent the first level of analysis needed to determine if the technology has sufficient attributes to warrant further investigation.

1. Do the products have sufficient communications range?

User requirements developed by the ASTM 5.9 GHz DSRC Users Group demonstrate that there is a wide range of communications distances needed for DSRC applications. For example, probe data collection uses distances on the order of 50 feet, while applications such as sending work zone warnings to vehicles needs a distance on the order of 1000 feet. Wireless LAN products typically have ranges of up to 300 feet, although in an outdoor application with a directional antenna, these products can be engineered to handle greater distances within the radiated power limitations of Part 15 of the FCC Rules. First generation Bluetooth products will have a range of 10 meters. The maximum and minimum communications zone needs to be estimated for every version of the wireless LAN product (frequency hopping, direct sequence, each data rate etc.) and compared against the DSRC requirements to see if the application has potential to be implemented with one of these products.

2. Do they have a sufficiently high data rate?

Vehicles moving at high speeds spend very little time in the communication zone of a DSRC installation. In order to successfully complete a transaction, data rates on the order of 1 Mbps or greater may be needed. Most wireless LAN products can support these data rates. Bluetooth products support a maximum data rate of 732 Kbps, but this is an

asymmetric rate without error correction. The maximum symmetric data rate with error correction is 172.8 Kbps. 802.11 products can support data rates of 1 Mbps to as high as 54 Mbps. However, as the data rate increases, the robustness of the link deteriorates in a mobile multipath environment.

3. Can the channel be accessed quickly enough to perform the transaction?

The main reason for this issue is that these products are designed for portable operations. The terminals using the network are expected to move from location to location, but are expected to be stationary while transmitting. The modulations and protocols have been optimized for use in office buildings, warehouses, factories, retail outlets, and other locations that would benefit from wireless LANs. The user terminals have to locate the system controller frequencies, synchronize transmission, authenticate the user, and access the channel before transmission can occur. If errors occur, stationary terminals have ample time to retransmit in a manner transparent to the user.

DSRC systems are designed for communications with terminals that operate at speeds common to highway and rail travel. Channel acquisition and transmission has to be very rapid and very reliable since the terminal will spend very little time in a communications zone. The specifications for each version of each product need to be examined closely, in particular, the MAC protocol, to determine for each DSRC application, whether the transaction can be completed before a vehicle leaves the estimated communications zone.

4. Is the modulation robust enough to perform reliably in the mobile environment?

Some wireless LAN products will operate while the terminal is moving. There are many factors that determine how fast and how reliable the communications will be. Different combinations of modulation and data rate will operate differently in the mobile multipath environment. Discussions held with members of the 802.11 committee confirms anecdotal evidence that low data rate (1Mbps direct sequence spread spectrum) 802.11 products work in some mobile applications, but members were highly skeptical of reliable operation at speeds in excess of 20 or 30 miles per hour. Performance the technologies described in this paper in a mobile multipath environment has not been evaluated. However it should be noted that the performance would be different for each data rate and modulation combination offered by each technology.

5. Can the system support the required number of concurrent users?

Each protocol has some limit on the number of terminals that can be active in a network at any given time. For example, a Bluetooth piconet can support only eight active terminals. Some DSRC applications, such as open gantry toll collection, will require communications to a larger number of users.

6. Is Part 15 operation acceptable?

To:
Mr. Richard Weiland, President
Weiland Consulting
Chairman ITSA 5.9 GHz Workshop

From:
Dan Bowlds
MPH Industries, Inc.
316 E. 9th St.
Owensboro, KY 42303

As a manufacturer of a DSRC safety warning transmitter operating in the 24.1 GHz band (approved by FCC, R&O FCC 99-9), MPH Industries would like to express its view point regarding a DSRC standard for the recently allocated 5.9 GHz band (R&O FCC 99-305).

SWS L.C. is a consortium of receiver manufacturers and licensees (such as MPH) that has an interest in DSRC, especially pertaining to safety warning. SWS contracted with Gene Greneker of GTRI (Georgia Tech Research Institute) to develop a communication standard suitable for safety warnings in vehicle-to-vehicle and fixed location-to-vehicle applications. The range requirements were such that ample warning of a safety hazard would be given to a driver of a vehicle moving at highway speeds. The standards set with regard to the frequency stability, modulation rate, bandwidth, etc. are sufficient for the anticipated needs, but are still set within the realm of achievable performance with existing low cost consumer electronic technologies. This was done to keep the benefit to cost ratio high, since the consumer was expected to pay for the device.

Speaking for SWS L.C., we feel that a similar situation exists with regard to the 5.9 GHz band. Public acceptance of products for specific DSRC applications will be gained (short of a mandate) by adding the feature on an existing product, yielding a high benefit to cost ratio. For this reason, a universal DSRC standard that fixes the frequency, bandwidth and modulation schemes for all applications may not be optimal (from a product cost standpoint). In the end it may turn out that the frequency bands are fragmented (0.9, 2.5, 5.9, 24.1 GHz) for DSRC applications, due to the different application requirements and existing system transitioning complications. With this in mind, it would be good to consider a specification that addressed the communication protocol and message structure with a flexible framework that could be expanded as the applications developed. Issues like DSRC device interfacing with the IDB could also be addressed since it appears that this will be required for safety and human factors considerations.

At this point we would like to leave the door open for our participation in the specification development process.

cc Brody Cash, Dick Schnacke

Subject: Request for 2MHz of Dedicated Bandwidth for Rear-End Collision Avoidance Applications Using Vehicle-to-Vehicle Communications.

One of the major intents of Congress for intelligent transportation systems is to improve the safety of the nation's highways. To implement this goal, the Federal Communications Commission has allocated 75 MHz for ITS applications.

Two megabits of this bandwidth should be dedicated to vehicle-to-vehicle communications for the specific safety purpose of eliminating rear-end collisions.

The specific product proposed is Intrass' look Ahead detection (LAD) system. A LAD system is a longitudinal collision avoidance system created by forming a linear network of vehicles in a lane and passing deceleration information back along this network. The information is processed in each vehicle and where warranted, warnings are made.

A prototype will be available in 2000 and domestic product and service introduction will begin in 2001 and the global introduction will follow in 2002.

The safety effect of the LAD system in the USA will be the elimination of a substantial number (10%) of rear-end collisions annually.

Because of the safety critical nature of this application a small and dedicated bandwidth should be allocated. Two MHz will allow packets of up to one megabit to be passed in a timely manner. The packets will contain deceleration, control and identification information and will be standard for all implementers of the system. Intrass will maintain and distribute the standard as a public Java API specification. The DOT should recommend that these standard packet definitions become national and international standards.

For more information on the proposed system please see the Intelligent Vehicle Quarterly summer issue.

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December 16-17, 1999
Holiday Inn Capitol, Washington, DC

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APPENDIX B

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ITS America

June 5, 2000

The Honorable Rodney Slater
Secretary of Transportation
U.S. Department of Transportation
400 Seventh Street S.W.
Washington, D.C. 20590

Dear Secretary Slater:

ITS America provides the following advice as a utilized Federal Advisory Committee regarding Dedicated Short-Range Communication (DSRC) at 5.9 GHz. Background for this advice is attached to this letter.

Background in Brief

- The FCC has allocated substantial bandwidth at 5.9 GHz primarily for ITS applications of DSRC, with an emphasis on safety applications. This allocation was in response to a petition from ITS America, which is organizationally committed to the effective use of this band to advance ITS opportunities in the U.S.

- The deployment of DSRC-based applications at 5.9 GHz still requires significant exploration and development, including the underlying technologies and approaches which can actually implement DSRC applications

- The ITS industry is under significant time-pressure to propose specific mechanisms to the FCC for the effective use of the 5.9 GHz band and to execute based on the rules which result. The industry's credibility and its continuing access to this spectrum depend on effective delivery in this area.

- ITS America believes that the near-term benefits that DSRC at 5.9 GHz offers can be significantly accelerated by U.S. DOT's support of industry consortia and consensus standards bodies working to specify and standardize DSRC.

- DSRC appears to have the potential for great future benefit in applications and areas which are not as yet well understood or quantified. ITS America believes that a U.S. DOT-led exploration of potential DSRC directions and benefits will be of significant

value in advancing the ITS industry, nationally interoperable DSRC deployment, and other U.S. DOT goals.

Advice

ITS America advises U.S. DOT to take the following steps, working in concert with ITS America:

1. Encourage the efforts of the industry consortia working toward mutually agreeable pre-competitive technical specifications for DSRC at 5.9 GHz. The background discussion attached includes a more detailed discussion of the forms this encouragement could take.

2. Encourage the efforts of the relevant SDOs[1] to move forward expeditiously with consensus standards, in concert with these consortia and the industry, on a schedule that harmonizes with the FCC schedule for rulings.

3. Initiate an exploration of future directions, benefits, and costs of deploying DSRC at 5.9 GHz, including specific mechanisms for quantifying, cost-justifying and realizing safety benefits; mechanisms and incentives for encouraging widespread adoption of DSRC devices in private and commercial vehicles; and mechanisms and incentives for encouraging widespread deployment of nationally interoperable public and private infrastructure to interact with equipped vehicles.

   ITS America recommends that DOT solicit public comment through the Federal Register and that, in conjunction with ITS America, it establish a Blue Ribbon Panel of public and private stakeholders to review this comment and help recommend and encourage ongoing implementation.

ITS America is ready to work with U.S. DOT to further define and oversee this process. ITS America recognizes that wireless communications is an evolving arena in which today's assumptions and recommendations can rapidly be overtaken by events. ITS America recommends that U.S. DOT's process be kept flexible and that it be regularly re-examined, so that it can adjust responsively to a changing landscape.

We thank you for this opportunity to help U.S. DOT formulate its program for DSRC at 5.9 GHz, and we look forward to continuing to fulfill our responsibility as a utilized Federal Advisory Committee.

Sincerely,

John Collins
President/CEO

Harold Worrall
Chairman, Board of Directors

[1] Notably the American Society for Testing and Materials (ASTM), the Institute of Electrical and Electronics Engineers (IEEE), and the Society of Automotive Engineers (SAE).

Background

In October 1999, the Federal Communications Commission allocated 75 MHz of spectrum in the 5.9 GHz band[2] "for use by Dedicated Short Range Communications (DSRC)[3] systems operating in the Intelligent Transportation System (ITS) radio service." In its notice of proposed rulemaking (NPRM), the FCC stated that "there is a need for spectrum for reliable short-range wireless communications links between vehicles traveling at highway speeds and roadside systems, i.e., DSRC."

The FCC noted that "DSRC applications are a key element in meeting the nation's transportation needs into the next century and in improving the safety of our nation's highways." The objective of the FCC's action was "to provide sufficient spectrum to permit the development of DSRC technologies to improve the Nation's transportation infrastructure and bolster the involvement of United States companies in this emerging industry."

In its Rule and Order (R&O), FCC **99**-305, adopted October 21,1999, the FCC concluded that "the 5.9 GHz range is appropriate for DSRC applications due to its potential compatibility with European and Asian DSRC developments, the availability of radio technology, signal propagation characteristics, and the available spectral capacity in this spectrum range" and that "an allocation of spectrum in the 5.9 GHz region is the best available choice for DSRC applications."

The U.S. DOT has sought ITS America's advice on the role it should take, if any, in advancing the use of DSRC in the 5.9 GHz band and in supporting the development of standards for the use of DSRC in this band. U.S. DOT sought this advice in light of, among other things: (1) U.S. DOT's identification of standards for DSRC at 5.9 GHz as critical to ensuring national ITS interoperability[4]; (2) the difficulty the ITS industry has experienced in arriving at consensus standards for the use of DSRC in other bands, even with federal support and encouragement; and (3) the variety of other technologies for communication with vehicles.

ITS America's Process

To prepare the advice requested by U.S. DOT, ITS America formed a Special Task Force on Standards Policy for Dedicated Short-Range Communications at 5.9 GHz, composed primarily of users representing a variety of current and prospective application areas, not technology vendors. The principal activity of the Task Force was to plan, conduct, and reflect on the results of a Stakeholders' Workshop which took place on December 16-17, 1999 in Washington. The workshop was structured to have stakeholders present their views and take part in discussions on current and potential uses for DSRC at 5.9 GHz, the current state of the art, and the relative merits of other technical alternatives. Stakeholder presentations took place

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[2]5.850-5.925 GHz

[3]The FCC adopted the following definition of DSRC: "The use of non-voice radio techniques to transfer data over short distances between roadside and mobile radio units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety and other intelligent transportation service applications in a variety of public and commercial environments. DSRC systems may also transmit status and instructional messages related to the units involved."

[4]*Intelligent Transportation Systems: Critical Standards*, report by U.S. DOT to Congress, June 1999.

on Thursday, December 16th. The morning of December 17th was devoted to an open discussion of the technical, business, and institutional issues surrounding the 5.9 GHz allocation.

Following the workshop, the Task Force met to develop its preliminary recommendations, based on the presentations and discussion of the preceding day and a half. Attachment 1 is the Agenda for the Stakeholders' Workshop. Attachment 2 is the list of participants. Attachment 3 identifies the members of the Special Task Force. The recommendations of the Task Force were subsequently reviewed, revised, and approved by ITS America's Coordinating Council and Board of Directors.

Observations and Conclusions

The characteristic that distinguishes DSRC from other short-range communications techniques is that DSRC is designed to communicate with vehicles moving at high speed. In addition, DSRC has the ability to establish dedicated links targeted to very small and specific areas.

The characteristic that distinguishes the use of the 5.9 GHz band for DSRC is its dedication to ITS applications, providing for a high level of reliability and a high assurance of channel availability when needed. Several of the safety-oriented applications intended to be implemented via DSRC at 5.9 GHz would be difficult to implement as reliably using alternate technologies.

In its successful petition to the FCC, ITS America characterized the proposed 5.9 GHz allocation for DSRC as having the promise to "enhance the efficiency of use of the transportation infrastructure, improve mobility and reduce traffic congestion, enable quicker emergency incident response from public safety agencies, improve safety inspections of commercial vehicles while reducing costly weigh station and border crossing delays, reduce health care costs attributable to traffic accidents, improve the management and security of the flow of hazardous materials throughout the nation and help realize billions of dollars of gain in economic productivity."[5] The petition further noted that "because of the critical safety functions of the DSRC user services, and the location-dependent nature of the information to be communicated over the DSRC links, the ITS National Architecture has identified a specific requirement for dedicated spectrum to serve the needs of DSRC."[6]

While safety-oriented applications alone probably do not provide a sufficient market to cost-justify the development of DSRC technology at 5.9 GHz, there are a number of other attractive applications which, if implemented using DSRC at 5.9 GHz, could help to cost-justify the technology development. These include applications involving communications to stationary or slow-moving vehicles; e.g., electronic payment for parking, drive-through fast food, or gasoline at the pump; downloading map data, local event information, or infotainment content; etc. DSRC at 5.9 GHz also has the promise to be the next-generation choice for electronic toll collection and CVO applications, when operators are ready to retire current systems.

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[5]"Petition for Rulemaking Before the Federal Communications Commission," ITS America, May 19, 1997, p. 1

[6]*ibid.*, p. 10

Other communications technologies are also applicable for stationary/slow-speed vehicle communications, and some of these technologies are coming to market more rapidly than is DSRC at 5.9 GHz. Still other communications technologies, including high-speed data transmission via new generations of cellular telephony, are becoming available for high-volume data interchanges with moving vehicles, in non-safety-critical situations.

To protect the spectrum allocated for ITS and to provide a low-risk foundation for the safety-oriented applications, ITS America and U.S. DOT need to encourage the early and ongoing wide-spread deployment of these and other wireless applications using DSRC at 5.9 GHz. ITS America has itself already convened a 5.9 GHz DSRC Users Group to help define and describe user requirements to the manufacturing community and to help the standards development process be responsive to these requirements. On any significant scale, such encouragement needs to be based on a sound understanding of the public safety benefits and the economic implications of such deployment, both of which still need to be developed.

In the short run, however, providing initial encouragement at modest levels can help assure that the DSRC opportunity is not lost because of timing considerations while the broader foundation is being laid. ITS America's fundamental recommendations to U.S. DOT are to help provide this short-term encouragement and to provide leadership and support for the development of the broader foundation.

ITS America notes the recent formation of a consortium of DSRC technology vendors and a consortium of OFDM equipment vendors (Wide Band Consortium) whose common objective is to move decisively and rapidly toward a mutually agreeable pre-competitive technical specification or standard for DSRC at 5.9 GHz. ITS America's advice to U.S. DOT includes encouragement of these consortia, so long as they are making significant forward progress. This encouragement could take the form of:

- Providing the services of a consultant on such FCC issues as band use, channelization, etc.
- Providing the services of a data security consultant for encryption issues
- Supporting common needs testing related to DSRC at 5.9 GHz, for example:
  + Environmental – ice, snow, slush, sand, dirt, dust
  + Performance evaluation – 802.11 protocol, modulation (BPSK, QPSK, other)
  + Validate existing IEEE 1455 Layer 7 standard for use at 5.9 GHz
  + Validate new standards for layers 1 and 2

ITS America's advice to U.S. DOT also includes encouragement of the consensus standardization process, which could take the form of:

- Funding contractors to help standards writing committees accelerate their development activities, including the services of editorial contractors to accelerate the drafting of standards for OSI layers 1 and 2 and the modification of IEEE 1455 to include safety messages, on-board bus data transfer procedures, and security procedures. The standards process could also share the consulting services described above for the vendor consortia.
- Funding state DOT participant travel to standards development meetings

- Defraying the administrative costs for SDO to operate relevant standards writing committees

To complement this short-term support and to help fully realize the vision for DSRC at 5.9 GHz, ITS America also recommends that U.S. DOT fund and help lead a wide-ranging exploration of the opportunities, challenges, benefits, and costs of deploying DSRC at 5.9 GHz. ITS America recommends that DOT solicit public comment through the Federal Register and that, in conjunction with ITS America, it establish a Blue Ribbon Panel of public and private stakeholders to review this comment and help recommend ongoing strategy. Areas for exploration include:

- Specific mechanisms for quantifying, cost-justifying and realizing safety and other benefits
- Mechanisms and incentives for encouraging widespread adoption of DSRC devices in private and commercial vehicles, potentially in conjunction with U.S. DOT's existing Intelligent Vehicle Initiative
- Mechanisms and incentives for encouraging widespread deployment of nationally interoperable public and private infrastructure to interact with equipped vehicles.

The material which follows is drawn from the book of proceedings and conclusions resulting from the "5.9 GHz Stakeholders Workshop for ITS Applications" conducted by ITS America on December 16-17, 1999. In addition to the materials which follow, the book contains copies of presentations and other submissions made at the Workshop.

It should be noted that the Formal Advice delivered to U.S. DOT by ITS America evolved significantly since the Workshop and its preliminary statement of results. For example, there was considerable sentiment at the Workshop to encourage U.S. DOT to explore the costs and benefits of mandating DSRC devices in new vehicles. However, in subsequent discussion and review, some ITS America members vigorously opposed this course, and it became clear that the ITS America Coordinating Council and Board of Directors would not approve it. Consequently, the advice was amended so that consensus for approval could be reached. In addition, discussion and review shaped the advice to support an additional industry consortium and to place greater emphasis on supporting the standards development process.

PRELIMINARY RESULTS OF THE STAKEHOLDERS' WORKSHOP ON DEDICATED SHORT-RANGE COMMUNICATIONS AT 5.9 GHz.

5.9 GHZ is dedicated to ITS applications

A primary attraction of the 5.9 GHz band for ITS applications is that it has been specifically set aside for these ITS uses. Other bands, especially where licensing is not required (e.g., 902-928 MHz), are vulnerable to crowding and interference. Lack of contention is especially important for safety-critical activities where reliability and speed are crucial. In addition, liability risks may be lower using of a band (like 5.9 GHz) where users have co-primary status and must be licensed.

DSRC aimed at applications needing high-reliability, real-time communications with moving vehicle. Without DSRC, some safety applications may not get deployed

Dedicated Short-Range Communication (DSRC) is particularly appropriate for applications whose requirements include high-reliability real-time data communications with a rapidly moving vehicle. High-reliability in this context includes the high likelihood of channel availability when needed. Commercial two-way radio, satellite communications, and cellular telephony do not meet the need for both high-reliability and real-time service and, in some cases, do not provide needed coverage. Applications include: toll collection (more generally road pricing), transparent commercial vehicle border crossing, traffic signal preemption by emergency and transit vehicles (green wave), in-vehicle warning systems for highway-rail intersections and highway work zones, etc. In the absence of a well-established DSRC base, some of these safety applications could be difficult or impractical to implement.

DSRC could be suitable for other applications as well, given a sizable installed based of DSRC

There are a variety of other applications, whose vehicle-infrastructure (VI) communications requirements are less demanding than those above. DSRC will work for these applications, too, but so will other VI communications technologies. These applications include a variety of fee payment applications (at quick service restaurant drive-throughs, parking lots, pay-at-the-pump gas stations, etc.) DSRC would probably not be the technology of first choice for these applications, but if vehicles were already equipped for DSRC, then using DSRC would potentially be more attractive than adding another RF device in the vehicle. Some applications have broader bandwidth or higher data throughput requirements than are currently envisioned for DSRC. These include multimedia applications (e.g., downloading a movie to a backseat entertainment system) and internet connection. Some, but probably not all, of these applications could be handled by an enhanced version of DSRC.

Only a clear market can justify the large technology investment needed for DSRC at 5.9GHz

Making DSRC available in the 5.9 GHz band will require a very large technology investment by prospective vendors. The vendors are reluctant to make such an investment unless there is a clear market for the resulting products. The case for such an investment depends on (a) the selection of DSRC at 5.9 GHz for a variety of applications beyond toll collection and CVO crossings, or (b) the decision to incorporate DSRC/5.9 transponders as standard equipment in new vehicles.

In turn, the market for DSRC depends, among other things, on the deployment of public and private infrastructure that will make use of DSRC at 5.9 GHz for fee collection, information delivery, etc.

Other communication technologies are almost ready for deployment

However, other technologies for VI communications are coming rapidly to market which can meet the requirements of applications that do not involve communicating with vehicles traveling at high speed. If DSRC at 5.9 GHz is not ready for deployment very soon, then these less demanding applications will be implemented using alternative VI communications technologies, drastically curtailing the available market for DSRC at 5.9 GHz. Application developers state that plans and prototypes for DSRC solutions will have to be available in 2000 if they are to be considered as technology candidates.

U.S. DOT might mandate DSRC, but process is slow; but industry could anticipate the mandate

Under certain circumstances (discussed below), U.S. DOT might move toward mandating DSRC devices in new vehicles. Such rulemaking would require two or more years to complete. However, it is not unreasonable to conclude that if U.S. DOT were moving steadily toward mandatory DSRC, automotive manufacturers might begin to incorporate DSRC devices into their new vehicles in advance of a regulatory requirement to do so.

Prospect of mandate could increase DSRC appeal

Similarly, if there was a clear, early movement toward incorporating DSRC technology in all new vehicles, the developers of applications requiring VI communications would potentially look more favorably on DSRC as the VI communications technology alternative.

Prerequisites for U.S. DOT DSRC mandate include clear public interest and well-accepted standard. Opposition is likely in any case.

For U.S. DOT to consider mandating DSRC, there are (at minimum) two prerequisites.

One is a clear public interest in the widespread deployment of DSRC. For example, an argument can be made that electronic toll collection and transparent CVO border crossings would help to relieve congestion, reduce fuel consumption, mitigate emissions, and improve safety. Similarly, DSRC-based in-vehicle warning systems could improve safety at highway-rail intersections, work sites, and other hazardous locations. The safety benefits of these applications will potentially not be realized

without broadly installed DSRC technology.

The second prerequisite is the existence of a well-accepted industry standard, consensus or de facto, for DSRC at 5.9 GHz.

Even if these prerequisites are met, it is likely that other interests would oppose such rule making.

DSRC standards needed rapidly; consortium has been proposed

Industry proponents of DSRC at 5.9 GHz are therefore under a significant onus to move forward at high speed toward a DSRC standard at 5.9 GHz. DSRC vendor representatives have proposed the formation of a vendor consortium to rapidly develop the relevant standard specifications and to promote the use of DSRC to the developers and deployers of applications using VI communications, notably including vehicle manufacturers.

Recommend that Consortium move ahead

Recommendation to DSRC technology vendors: To form a consortium to work toward the rapid development and delivery of a standard 5.9 GHz DSRC specification by late spring 2000, preferably one which encourages an open development environment that will help to enable to the broadest possible set of applications.

Recommend that U.S. DOT encourage work of Consortium

Recommendation to U.S. DOT: To support the work of such a consortium to prepare a suitable standard specification by late spring 2000, to the extent of:

- Providing the services of an FCC Consultant (on such issues as band use, channelization)
- Providing the services of a data security consultant (encryption requirements)
- Providing the services of a standards editorial contractor (all layers)
- Supporting common needs testing related to DSRC at 5.9 GHz:
  - + Environmental – ice, snow, slush, sand, dirt, dust
  - + Performance evaluation – 802.11 protocol, modulation (BPSK, QPSK, other)
  - + Validate existing IEEE 1455 Layer 7 standard for use at 5.9 GHz
  - + Validate new standards for Layers 1 and 2

Recommend that U.S. DOT initiate public comment on DSRC mandate

Recommendation to U.S. DOT: To initiate public comment, potentially leading to rulemaking on the inclusion in all new vehicles of an industry-standard DSRC transponder at 5.9 GHz. Such a process would be terminated without action if such a standard specification were not in place by mid-2000. It is suggested that U.S. DOT develop, for inclusion in the request for public comment, a draft set of criteria by which to evaluate the appropriateness of IV communications alternatives, including DSRC at 5.9 GHz. It is suggested that these criteria focus first

on the public interest related applications (e.g., safety), but also pay attention to applications of more general interest that will help to drive the market, including e-commerce and broadband applications.

Recommend that U.S. DOT encourage infrastructure deployment

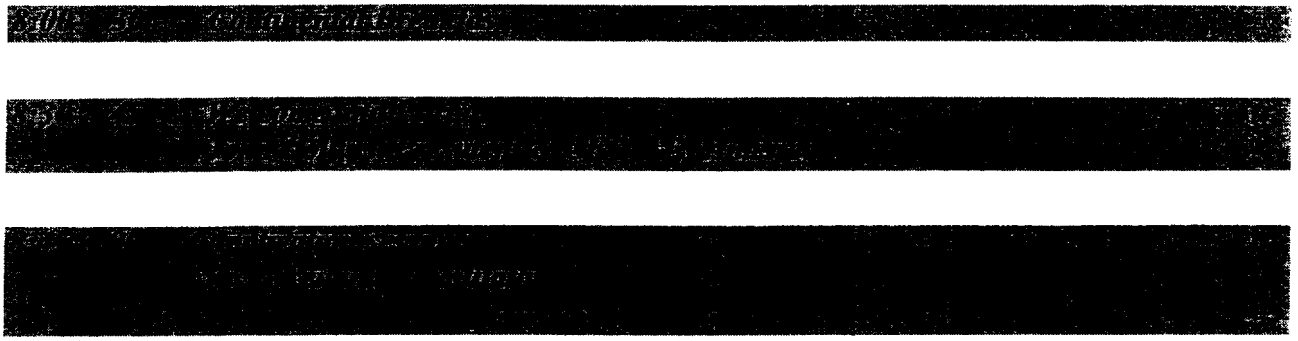
Recommendation to U.S. DOT: At such point that a rule to mandate the inclusion of transponders appears likely, to initiate the formulation of policies and incentives to encourage state and local authorities and private sector ISPs to deploy infrastructure and develop national application standards for the deployment of interoperable toll, CVO, and warning system applications using in-vehicle DSRC at 5.9 GHz.

5.9GHz Stakeholders Workshop for ITS Applications

December 16-17, 1999, Holiday Inn Capitol, Washington, DC

Agenda

Day 1



Topics

5.9 GHz User Requirements (8:45-9:15)
Speaker: Broady Cash, ARINC

Financial/Toll (9:15-10:15)
Speakers: Ben Bates, Equiva Services; Neil Schuster, IBTTA; Rena Barta, EZPass; James Bucklar, Texas Instruments

Security & Access (10:15-10:45)
Speakers: Virginia Williams, Security Industry Association; Sam Oyama, Hitachi

Break (10:45-11:00)

Information (11:00-11:50)
Speakers: Sheldon Leader, Edwards & Kelcey; Arlan Stehney, IDB Forum; Bart Stevens, SmartMove

Lunch on your own (11:50-1:00)

Control (1:00-1:50)
Speakers: Steve Shladover, PATH; Mike Duoos, 3M; Guy Rini, Mack Trucks

Fleets (1:50-3:00)
Speakers: Don Soults, Truckstops; Joe LoVecchio, Transit; Howard Moody, AAR; Bob Luminati, Landstar

Break (3:00-3:15)

[redacted]

Speakers: Dick Schnacke, Vendor Community Perspective
Mark IV, SIRIT, others

[redacted]

Speaker: Bob Kelly, Squire, Sanders & Dempsey

Day 2

[redacted]

1. What applications, using short-range wireless communications, are expected to be commercially available:

   - Within one year
   - Within 1-3 years

2. What are the leading technology candidates for implementing communications for these applications?

3. For which applications is DSRC at 5.9 GHz a serious contender.

4. What are the principal obstacles and challenges for the use of DSRC at 5.9 GHz.

   - Business issues
   - Technology issues
   - Institutional issues
   - Regulatory issues

5. What role will standards play in creating an interoperable wireless environment, both in general and at for DSRC at 5.9 GHz?

6. What is the appropriate role (if any) for U.S. DOT in helping to create the interoperable wireless environment? in promoting standards for this environment? in promoting standards specifically for DSRC at 5.9 GHz.

7. Same question, but for ITS America.

8. What kind of interactions should take place between U.S. DOT and the FCC in creating the interoperable wireless environment? in promoting DSRC and standards for DSRC at 5.9 GHz?

[redacted]

Appendix 2 – Stakeholders Workshop Participants

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Appendix 3 – Task Force Members

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Security Industry Association

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*Non-voting